ADVANCED AMPHIBIOUS ASSAULT VEHICLE (AAAV)

The Advanced Amphibious Assault Vehicle is an amphibious armored personnel carrier that will replace the current Marine Corps assault amphibian - the AAV7A1. Two variants are under development: the personnel variant (AAAV(P)), which will be armed with a 30-mm cannon and a 7.62-mm machinegun, is intended to transport 17 combat-equipped Marines and a 3-man crew, and a command and control variant (AAAV(C)), which will transport a commander and staff. An operationally-configured AAAV will weigh about 37 tons and travel in excess of 20 knots in 3-foot significant wave height water conditions, and at 43 miles per hour over land.

The AAAV is designed primarily to provide an over-the-horizon amphibious assault capability for Marine Air-Ground Task Force elements embarked aboard amphibious ships. Once ashore, the AAAV(P) will be an armored personnel carrier, providing transportation, protection, and direct fire support. The AAAV(C) will serve as a tactical echelon command post.

BACKGROUND INFORMATION

The AAAV program entered the Program Definition-Risk Reduction (PDRR) phase after Milestone I in 1995. In December 2000, the AAAV entered the System Development and Demonstration phase. The current TEMP had been approved by OSD in November 2000. Delays in completing DT and OT have led to a program baseline breach, which is expected to delay the LRIP decision and IOC by approximately one year. A baseline breach necessitates a TEMP update, which DOT&E is supporting through the program's T&E Integrated Product Team; it should be forwarded to OSD for approval in December 2001.

TEST & EVALUATION ACTIVITY

T&E activities during 2001 consisted primarily of DT of the three PDRR AAAV(P) prototypes, including land mobility, water mobility, and firepower testing; these events will continue into FY02.

In addition, MCOTEA performed an EOA using a wood mockup to represent the AAAV(C)'s interior and a representation of the C4I suite comprising mostly COTS surrogates. Communications were simulated using wire connections rather than over-the-air radio transmissions. Marines from II Marine Expeditionary Force acted as elements of a battalion and a regimental staff to assess human factors engineering issues.

The LFT&E Ballistic Hull and Turret (BH&T) test series was begun in December 2000 and completed in July 2001. The fidelity of the BH&T allowed for shock input measurements for various critical components, and limited estimates of vehicle loss of functionality following certain test events.

MCOTEA and the U.S. Army Evaluation Center (AEC) began work on a formal Memorandum of Agreement clearly defining the participation of each in AAAV LFT&E. Ballistic Vulnerability (BV) test planning was begun under the guidance of MCOTEA and AEC in July 2001. The recent program acquisition baseline breach will require re-examination of the LFT&E Strategy in the TEMP.

TEST & EVALUATION ASSESSMENT

The procurement of three PDRR AAAV(P) prototypes allowed land, water, and firepower testing to proceed in parallel and more efficiently. DT focused on land mobility (for example, braking, acceleration, and negotiating slopes), water mobility (such as speed at different weight conditions), and gunnery. Testing appears incomplete relating to operating in the ocean, transiting surf zones, and operating sequentially in water and on land. However, monitoring DT and its results has been difficult, primarily because information about ongoing DT is not available to DOT&E or MCOTEA in a timely manner. DOT&E has requested that the PM provide access and notification of ongoing DT, which will aid in the future oversight of the OT assessments and testing.

DT has exposed numerous engineering problems, the early discovery of which should lead to an improved design for the ten prototypes that will be constructed during the SDD phase. However, these unexpected engineering challenges and poor prototype reliability have caused DT to fall 9 to 13 months behind schedule, raised questions about design maturity, and impacted the OT test program by delaying the EOA. Continuing to defer the AAAV(P) EOA makes it less likely that early OT results will contribute to the SDD prototype design. In addition, the schedule for future DT appears to be unrealistically optimistic in terms of allowing enough time to test, fix, and retest. Despite the fact that more time was needed than was planned for DT of the PDRR prototypes, the current schedule allows only a limited time for SDD prototype DT before the start of the FY04 SDD EOA. Consequently, DOT&E is concerned that the SDD prototypes might not be sufficiently tested before the SDD OA begins. Similarly, there is little time scheduled for DT of the LRIP vehicles that will support the IOT&E.

Data from the DT and OT that have been completed have raised several concerns:

- The AAAV's demonstrated reliability has fallen short of reliability growth predictions. In response, the Program Office implemented an aggressive program to determine root causes for these failures and identify corrective actions.
- The KPP to transport 17 combat-equipped Marines has not yet been demonstrated in the water because of the absence of safety certifications.
- To meet strength, weight, and cost constraints, the program office is using the aluminum alloy Al 2519 even though corrosion test results confirm that Al 2519 is less suitable for the marine environment than the aluminum alloy used in existing vehicles.
- The results of the AAAV(C) EOA in FY01 were mixed. There did not appear to be significant human factors environment problems. However, attempting to obtain operational insights by exposing the test participants to a simulated C4I suite in a wood mockup was less than ideal. The lack of a fully functional C4I system did not allow an assessment of essential

communications links, and hence situational awareness, however, the test C4I suite configuration was sufficient to determine that integrating the C4I software applications requires more attention.

- Safety and performance-related restrictions reduce what can be attempted in OT. Interior noise levels currently limit the amount of time embarked Marines can remain in the vehicle. Carbon monoxide accumulates in the vehicle during 30-mm cannon firing. The temperature inside the vehicle rises to unsafe levels in high ambient temperatures, restricting troop transport and requiring that some electronic components be cooled with cooling packs to prevent overheating.

In summary, many operationally relevant questions remain unanswered. The AAAV(P) has not demonstrated that it can accomplish its primary mission, that is, transport combat-equipped Marines from an amphibious ship located 20 to 25 nautical miles offshore to objectives located inland without degrading their physical condition. Finally, the performance of an integrated AAAV(C), the more complicated variant, has still not been demonstrated to DOT&E.

LFT&E of the AAAV includes vulnerability evaluation of the vehicle to the broad range of threat weapons described in the AAAV System Threat Assessment Report. The test foundation of LFT&E rests upon a BH&T test series in FY01, a BV test series in FY02-03, and a Full-up System Level (FUSL) test series in FY04-05. Other LFT&E testing that will include ballistic testing of representative armor coupons, and subsystem controlled damage testing. Conduct of the BH&T test series contributed substantially to understanding the vehicle armor and structural response to ballistic attack. Several specific unexpected vulnerabilities were identified and design changes will have to be incorporated based on the results of BH&T.

LFT&E of the AAAV also includes a lethality evaluation of the 30-mm high-explosive ammunition against the range of expected targets. The Direct Reporting Program Manager, AAA (DRPM) has conducted extensive firing of existing and developmental 30-mm high-explosive ammunition.

Initial planning for the BV test has revealed a shortcoming in the LFT&E Strategy. DRPM-AAA was basing the LFT&E Strategy upon conduct of system-level ballistic testing against a functional and near-production-representative PDRR prototype vehicle early in SDD. The program office had felt that the PDRR prototypes represented a nearly mature design and that this, combined with their availability for early testing, more than offset the elimination of one of the two originally planned FUSL test assets. The PDRR prototypes have proven to be far less mature than anticipated. The future production configuration will incorporate substantial changes in structure, component physical layout and subsystem functional architecture. Adding a second FUSL test asset will allow more efficient use of range time, provide an immediate source of major critical repair parts when necessary, and reduce the scope of repairs to cumulative damage by dividing test events between the two vehicles.

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